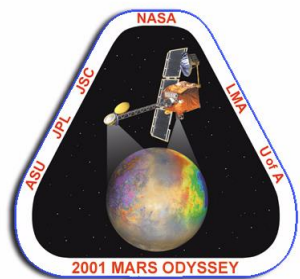
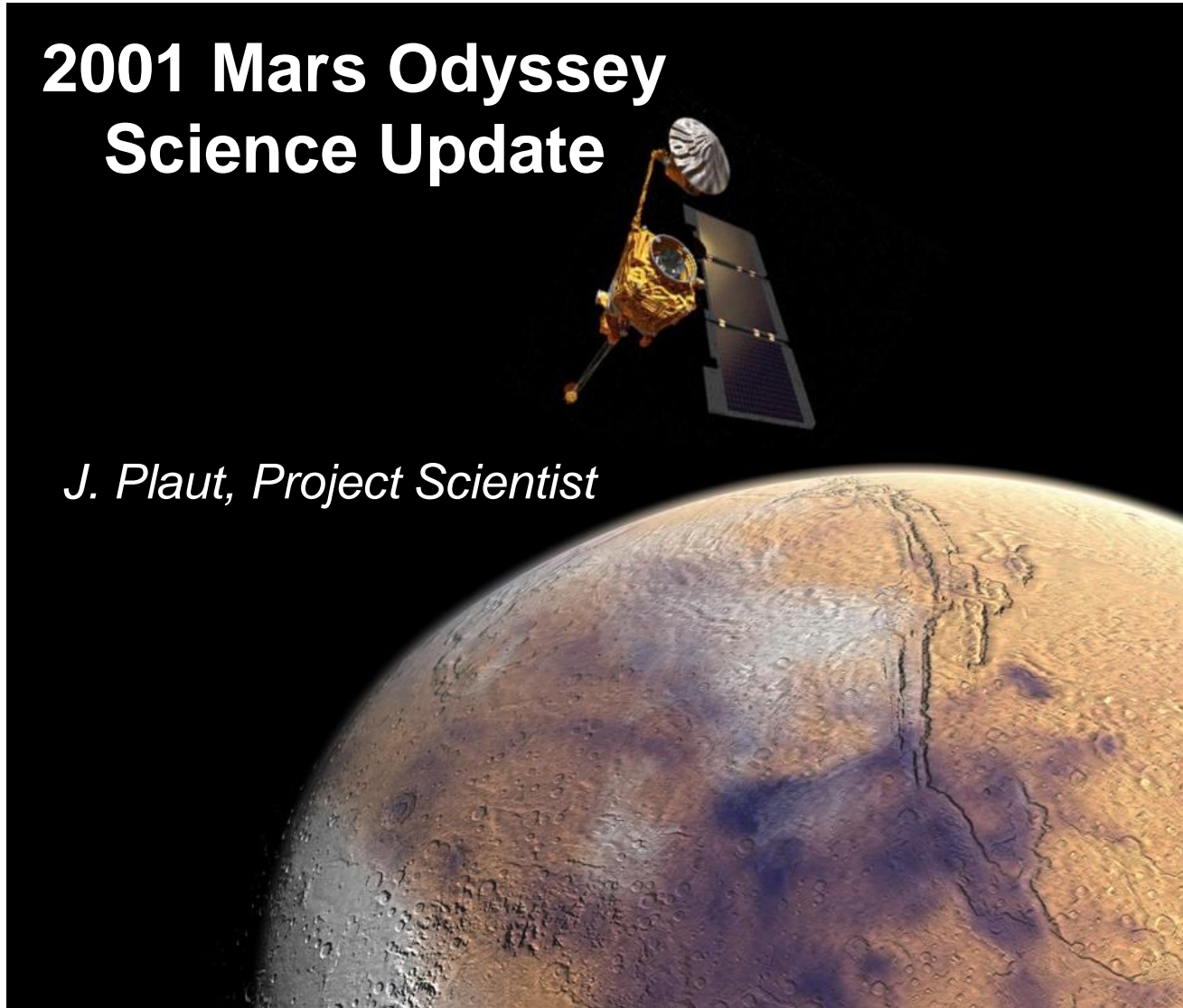


2001 Mars Odyssey Science Update

J. Plaut, Project Scientist



By the Numbers

- Years since launch: 15.8
- Earth years in science orbit: 15.0
- Mars years in science orbit: 8.0
- Science orbits: 66,501
- Total orbits: 67,317
- Extended missions: 7 (E7 started Oct. 2016)
- Science data returned: 1.4 TeraBytes
- Science data archived: 20.1 TeraBytes

Instrument Status

- THEMIS
 - Fully functional
 - No degradation observed since launch
- GRS
 - Neutron detectors (HEND and NS) fully functional
 - Gamma sensor decommissioned in 2011
- MARIE
 - Decommissioned in 2003

Some Recent Odyssey Publications

The geologic history of Margaritifer basin, Mars. JGR 2016 - Salvatore et al.

Recurring slope lineae and chlorides on the surface of Mars. JGR 2016 - Mitchell and Christensen

The association of hydrogen with sulfur on Mars across latitudes, longitudes, and compositional extremes. JGR 2016 - Karunatillake et al.

Assessing the geologic evolution of Greater Thaumasia, Mars. JGR 2016 - Hood et al.

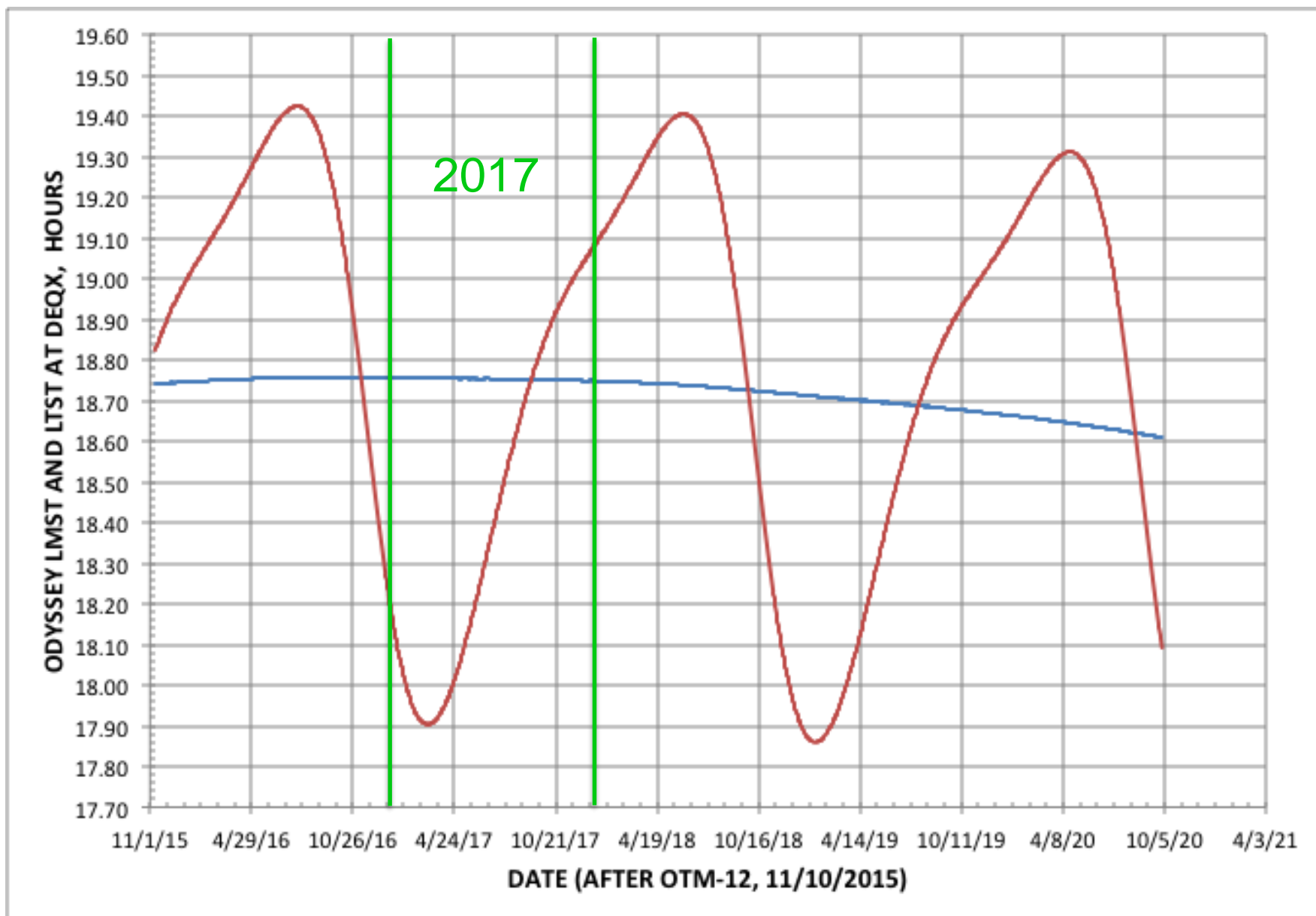
Constraints on the composition and particle size of chloride salt-bearing deposits on Mars. JGR 2016 - Glotch et al.

The water content of recurring slope lineae on Mars. GRL 2016 - Edwards and Piqueux

Extensive aqueous deposits at the base of the dichotomy boundary in Nilosyrtis Mensae, Mars. Icarus 2016 - Bandfield and Amador

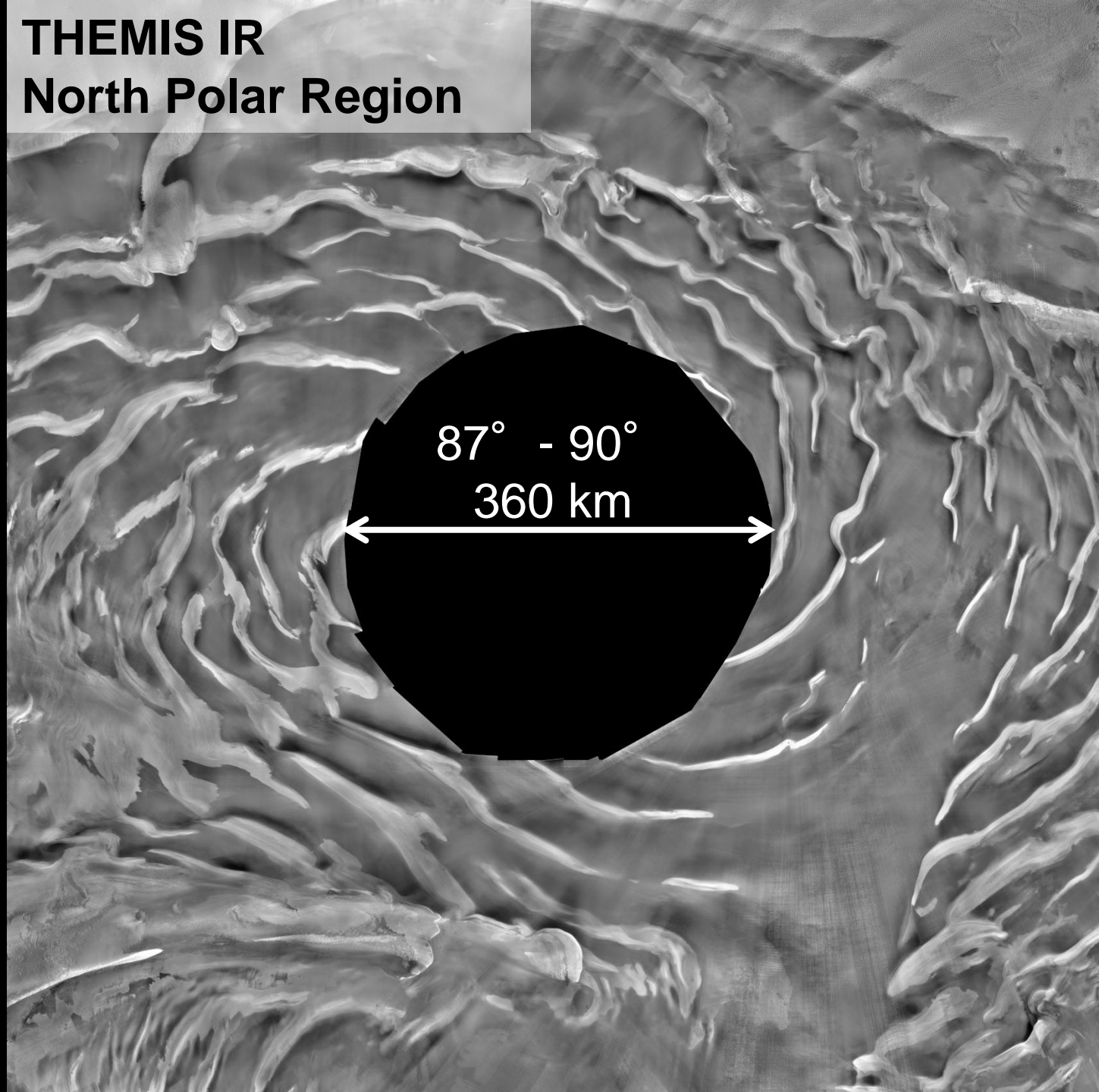
Elevated bulk-silica exposures and evidence for multiple aqueous alteration episodes in Nili Fossae, Mars. Icarus 2016 - Amador and Bandfield

Odyssey Local Mean Solar Time Variation - Almost Five Years

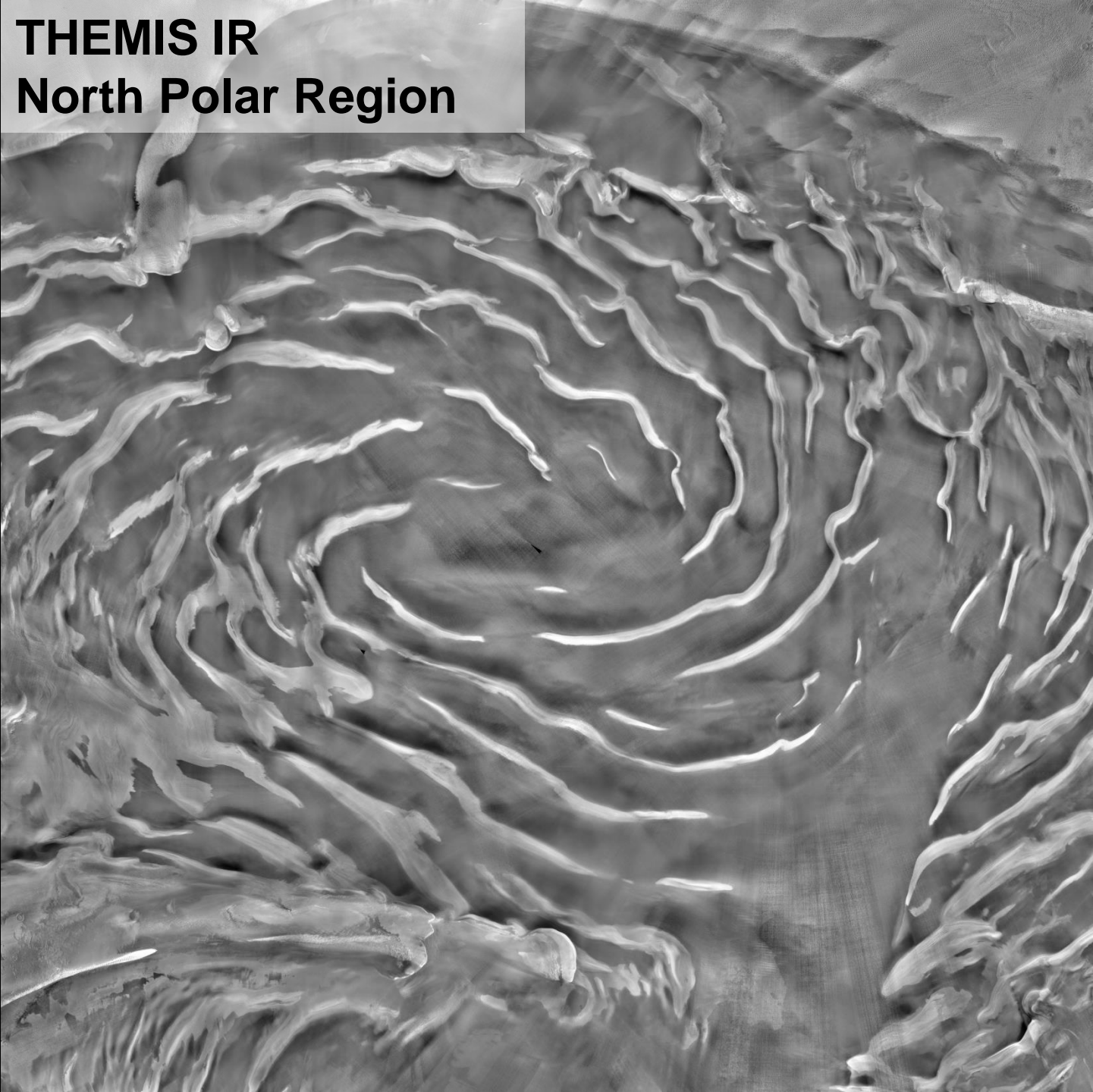


Filling the Polar Gaps

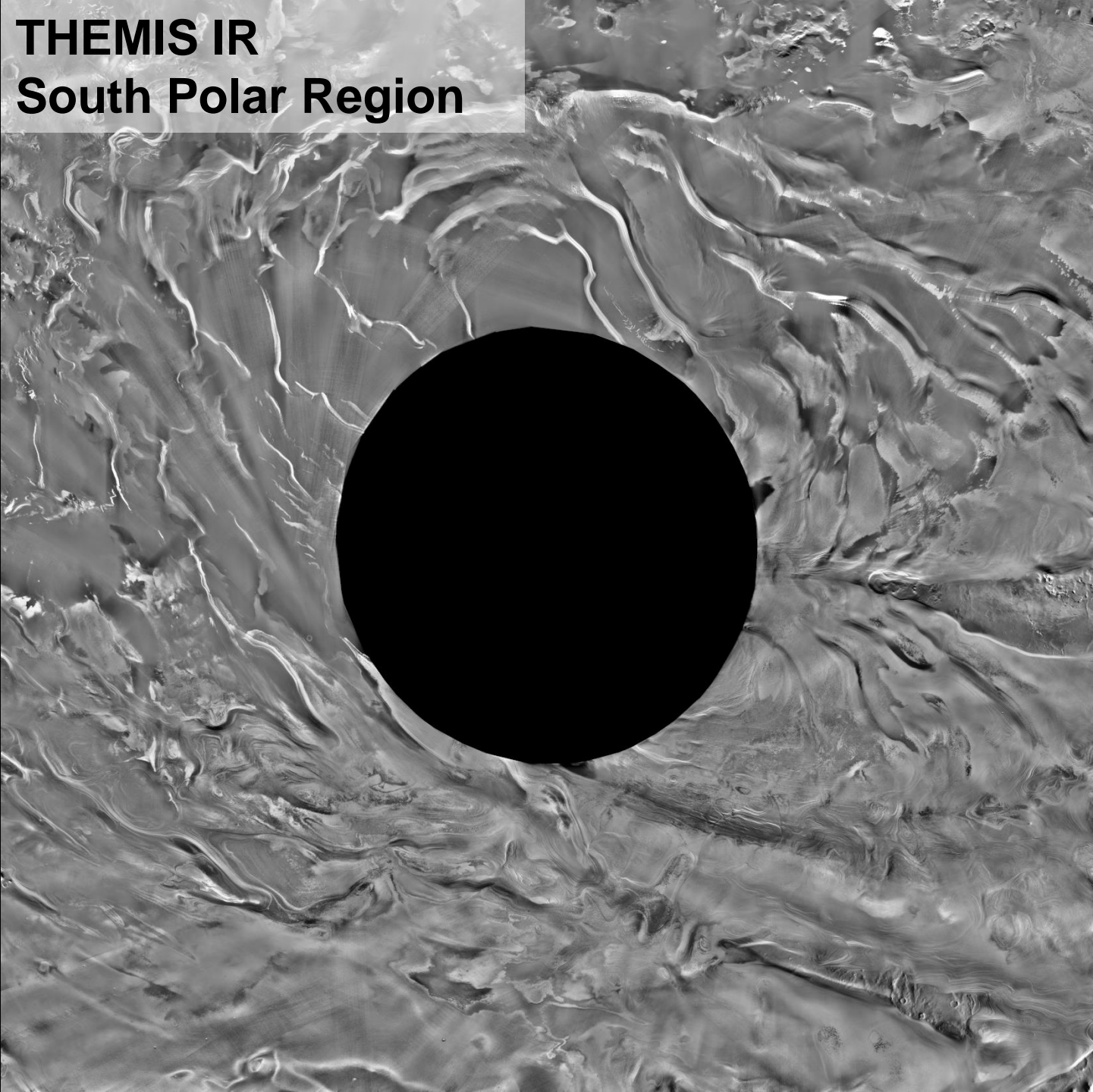
THEMIS IR
North Polar Region



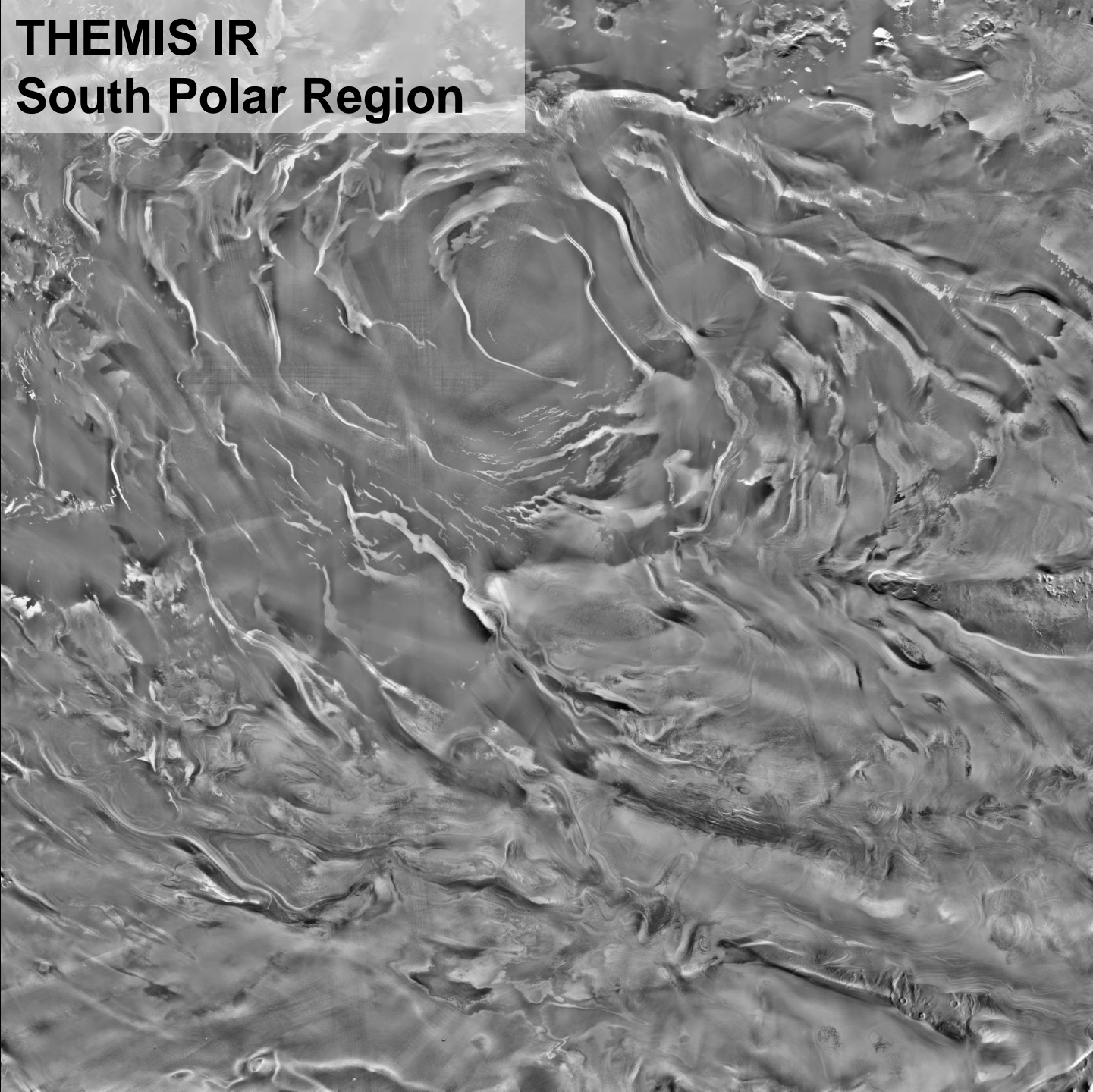
THEMIS IR North Polar Region



THEMIS IR
South Polar Region



THEMIS IR
South Polar Region



Science Objectives for the Extended Mission



Life

- Identify environments that may have been habitable in the past or present and characterize conditions and processes that influenced the nature or degree of habitability



Climate

- Provide an understanding of the distribution of water, carbon dioxide and dust, in the atmosphere and exchanging with the surface



Geology

- Generate a global picture of the Martian surface thermophysical and geomorphological properties



Humans

- Provide an understanding of the Martian radiation environment and its variability as a function of time

Odyssey's Science Objectives are aligned with the **Decadal Survey's** three high priority science goals for Mars Exploration, along with the "Interconnection" to human exploration.

Odyssey's objectives address each of the four **MEPAG goal** areas.

Investigations (1 of 2)



Life

- Search for thermal anomalies associated with active subsurface hydrothermal systems having the potential to host liquid water and/or brines
- **Investigate and map the surface geological context of sites favorable for past life, including the surface response to diurnal and annual thermal cycles, and identify potential sample return sites likely to represent hydrothermal or subaqueous environments**



Climate

- Determine the spatial and temporal distribution of atmospheric temperature, pressure, water vapor, and dust
- Study processes of cloud dynamics and surface frost at morning daylight local times
- **Characterize energy inputs/outputs at the surface (e.g., reflected light, emitted radiation) that are contributors to surface energy balance (an atmospheric forcing mechanism)**
- Map the distribution of ice and dust layers in the polar layered deposits (PLD), and the extent of glacial and periglacial features
- Determine the thickness of seasonal CO₂ frost
- Map the hydrogen abundance and infer the depth of water
- **Investigate the processes operating in the north and south polar caps at all seasons**

12

[BOLD = Investigations with new opportunities in the new local time orbit]

Investigations (2 of 2)



Geology

- Study sedimentary, igneous, and impact geology and processes, as well as landing site characteristics
- **Characterize the geology and thermophysical properties of Phobos**



Human Exploration

- Monitor the radiation dosage at Mars
- Characterize solar particle events at Mars

[BOLD = Investigations with new opportunities in the Extended Mission]

- Plans for upcoming period:
 - Morning daylight and post-sunset local times: atmospheric and surface monitoring; thermophysical behavior
 - 2017: Low data rate season for THEMIS
 - 2018: High data rate, late morning local times
 - Planning for Phobos imaging
- A concern:
 - No redundancy on reaction wheels
 - Another reaction wheel failure would reduce remaining mission duration to ~1-2 years.

THEMIS Visible

Seasonal frost at
low latitudes

V63122007

Lat = -28.5°

Ls = 119

LT = 7.2



10 km



THEMIS Visible

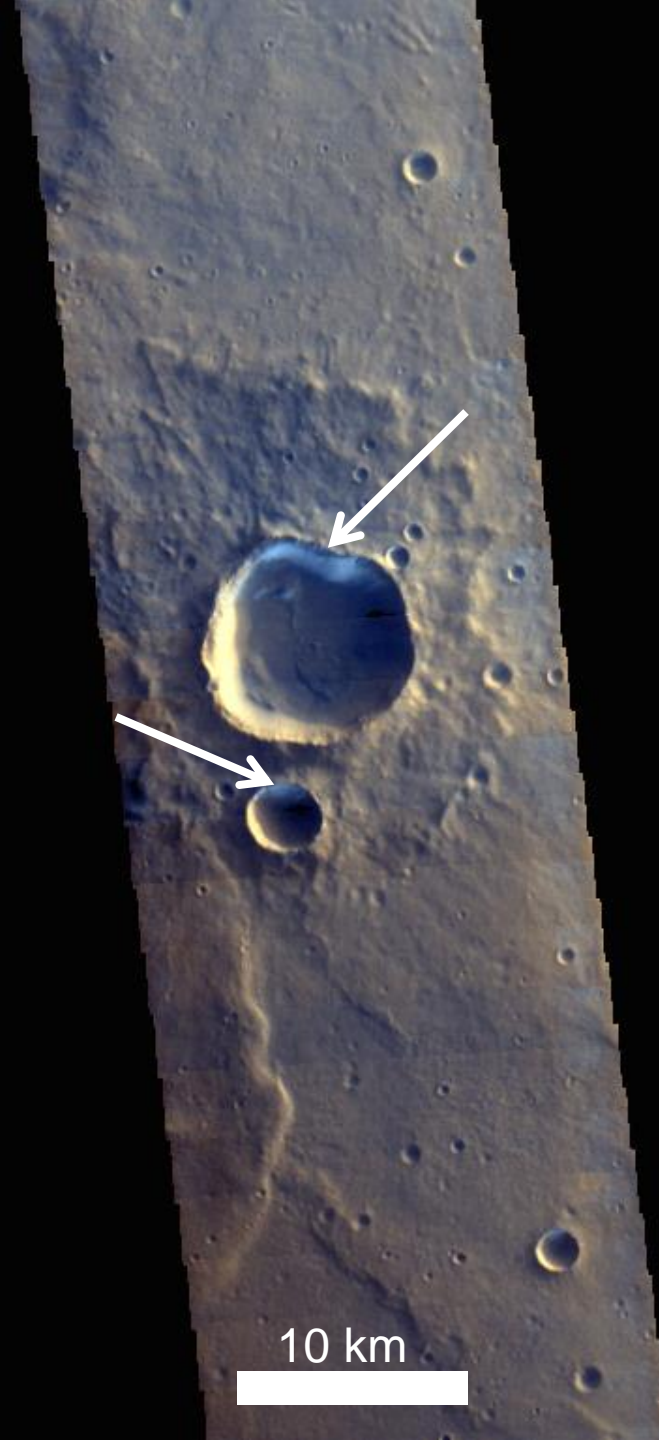
Seasonal frost at
low latitudes

V63122007

Lat = -28.5°

Ls = 119

LT = 7.2



10 km